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# FIELD NURSERY OVERVIEW - SIZE, SYSTEMS, AND ENTERPRISE MIX IN U.S.D.A. PLANT HARDINESS ZONES FIVE AND SIX

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## INTRODUCTION

To make more informed decisions as to whether to enter, leave, or expand field production, nurserymen require production, marketing and financial information. Although field production continues to produce the majority of plants grown for the landscape market, changes and competition in the industry make it imperative that nurserymen systematically determine production costs.

Comprehensive cost models have recently been developed for container grown crops in U.S.D.A. Plant Hardiness Zone 6 (3), for field grown crops in U.S.D.A Plant Hardiness Zones 7 and 8 (1), and for field grown crops in U.S.D.A. Plant Hardiness Zones 5 and 6 (2). This paper presents a small portion of the information provided for the 200 acre nursery in the latter study (2). These comprehensive cost models include physical coefficients so that information can be readily updated. Information provided by these studies provide a basis for decision-making for those evaluating the profitability of either establishing a new field

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nursery, expanding an existing field nursery or phasing out of field production.

## OBJECTIVES

The objectives of this study which are reported in this paper were to:

1. Model production systems that would accomodate a majority of the species of plants being field-grown in U.S.D.A. Plant Hardiness Zones 5 and 6.
2. Analyze the important species of plants commonly grown in the field in U.S.D.A. Plant Hardiness Zones 5 and 6, and assign each of them to one of the designated groups based on similarities of growing and production requirements.
3. Design physical facilities including land areas, land improvements, irrigation systems, and buildings for a commercial field nursery based on the model production system.

## MATERIALS AND METHODS

Model firms were synthesized using the conceptual framework of economic engineering wherein the "best proven practice" was included in each model. They were synthesized based on the North Central region. If specific items were required (i.e. depth of the well), coefficients were based on the Columbus, Ohio area.

The complete models included developing an appropriate production cycle (Tables 1 and 2); schematic drawings of the physical layout (Figures 1 and 2), including buildings and irrigation system; lists of equipment and other items; a complete sequence by month and year of nursery operational steps beginning with land preparation and ending with loading the finished product for wholesale distribution; and budgets for fixed and variable costs (2).

Data for this study were obtained from wholesale nurseries and nursery suppliers in the North Central region during the late Autumn and Winter of 1984 and the Spring of 1985. Price quotations obtained were for the 1985 production season. The basic goals in synthesizing the production facilities (see Figures 1 and 2) were to minimize labor expenses, flow and movement of plant material and equipment, water runoff, maximize the number of salable plants and allow future expansion.

The nursery reported in this paper included 170 acres of growing space and 30 acres of production facilities, holding area, field bed area and roads. It was ascertained that it would take a nursery of at least 200 acres to use the model's modern facilities and equipment in an economically efficient manner.

Assumptions

1. It was assumed that the model nursery would be self sufficient except for tree "lining-out" stock.
2. Purchase of new machinery and equipment was assumed for the model nurseries to achieve "true replacement

costs". Many nurserymen may choose to buy used equipment, rent equipment, or time-share some expensive items with other nurseries.

General

A model facility was synthesized for a 200 acre nursery (Figures 1 and 2). The model was designed for future expansion. Thus, expansion can occur with a minimum of disruption. If growing space were expanded, the central area could be easily expanded without affecting "permanent" facilities.

## ENTERPRISE MIX

We assumed that the model nursery would produce a diverse line of nursery stock. The length of the production cycle for the different species grown will vary. Five cultural groups were selected. While not all inclusive, the groups do permit a range of per unit costs to be developed as they relate to input costs and cultural factors (Table 1). For analytical purposes, we assumed that each cultural group would occupy 20% of the growing area (34 acres per group). Annual sales capacity would be 90,867 plants (Table 2). For detailed analysis, one specific plant from each group was chosen as representative of the group. While it is recognized that other plants from each category would have somewhat different requirements, it was felt that the requirements would not vary significantly in cost from the representative plant. The five groups (plant types chosen for detailed analysis are designated with a star) with some of their

cultural characteristics are listed below:

| Group | Plant | Cultural Characteristics |
|---|---|---|
| I. | SLOW GROWING EVERGREENS | |
| | *Taxus (species) | 18-24" salable plant |
| | Buxus (species) | 12" B&B |
| | | 10.2 sq. ft. of growing space per plant |
| II. | RAPID GROWING EVERGREENS | |
| | *Juniperus | 18-24" salable plant |
| | chinensis (varieties) | 12" B&B |
| | horizontalis (varieties) | 10.2 sq. ft. of growing space per plant |
| | Pinus strobus | |
| | Thuja (species) | |
| III. | DECIDUOUS SHRUBS | |
| | *Viburnum (species) | 18-24" salable plant |
| | Forsythia (species) | 12" B&B |
| | Weigela (species) | 11.9 sq. ft. of growing space per plant |
| | Ligustrum (species) | |

IV. SHADE TREES

| | |
|---|---|
| *Acer rubrum (varieties) | 2" caliper |
| Acer platanoides (varieties) | 24" B&B |
| Fraxinus (species) | 33.6 sq. ft. of growing space per plant |
| Quercus (species) | |
| Tilia (species) | |
| Gleditsia (species) | |

V. ORNAMENTAL TREES

| | |
|---|---|
| *Malus (flowering crab) (species) | 5-6' (1 1/2 - 1 3/4" caliper) |
| Prunus (Ornamental plums) (species) | 20" B&B 28.7 sq. ft. per plant |

This mixture of plants material, would all be packaged in soil balls (balled and burlapped). Groups I, II, and III would be harvested by hand and Groups IV and V would require the assistance of a mechanical spade for harvesting.

## SUMMARY

Production schemes were developed for five categories of field-grown ornamental crops being produced in U.S.D.A. Plant Hardiness Zones 5 and 6. These five plant categories would include approximately 90 percent of all field-grown nursery plants being produced in the North Central Region. Based upon these schemes, a 200 acre model field nursery was synthesized.

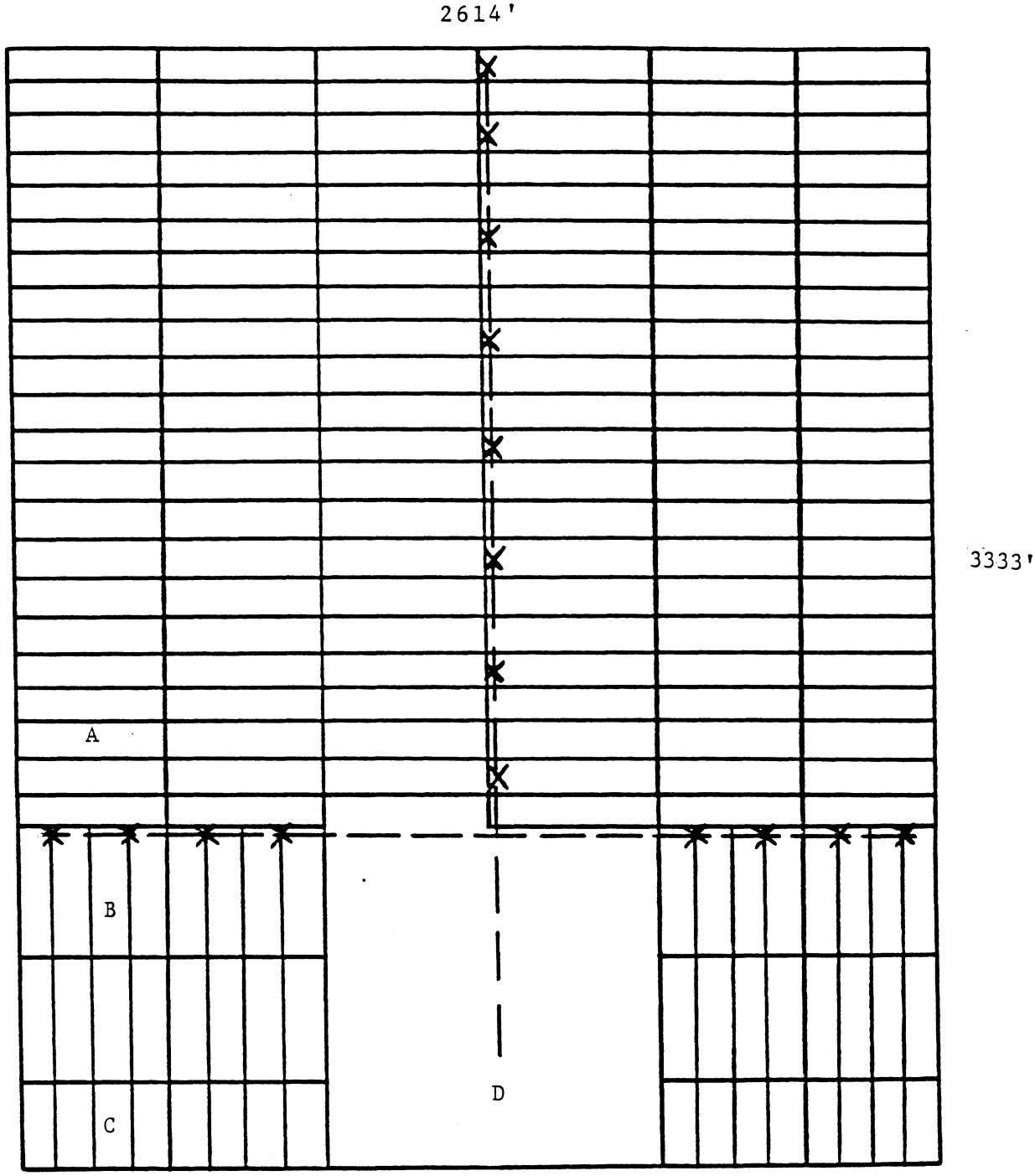
## LITERATURE CITED

1. Badenhop, M.B., and T.D. Phillips and S-103 Technical Committee. 1985. Costs of Establishing and Operating Field Nurseries Differentiated by Size of Firm and Species of Plant in USDA Climatic Zones 7 and 8. Southern Coop. Ser. Bull. 311.

2. Taylor, Reed D., Harold H. Kneen, Elton M. Smith, David E. Hahn, and Stanley Uchida. 1985. Costs of Establishing and Operating Field Nurseries Differentiated by Size of Firm and Species of Plant in U.S.D.A. Plant Hardiness Zones Five and Six. ESO 1171, Dept. of Agr. Econ. & Rur. Soc., The Ohio State University.

3. Taylor, Reed D., Harold H. Kneen, David E. Hahn, Elton M. Smith and the S-103 Technical Committee. 1983. Costs of Establishing and Operating Container Nurseries Differentiated by Species of Plant in U.S.D.A. Climatic Zone Six. Southern Coop. Ser. Bull. 301.

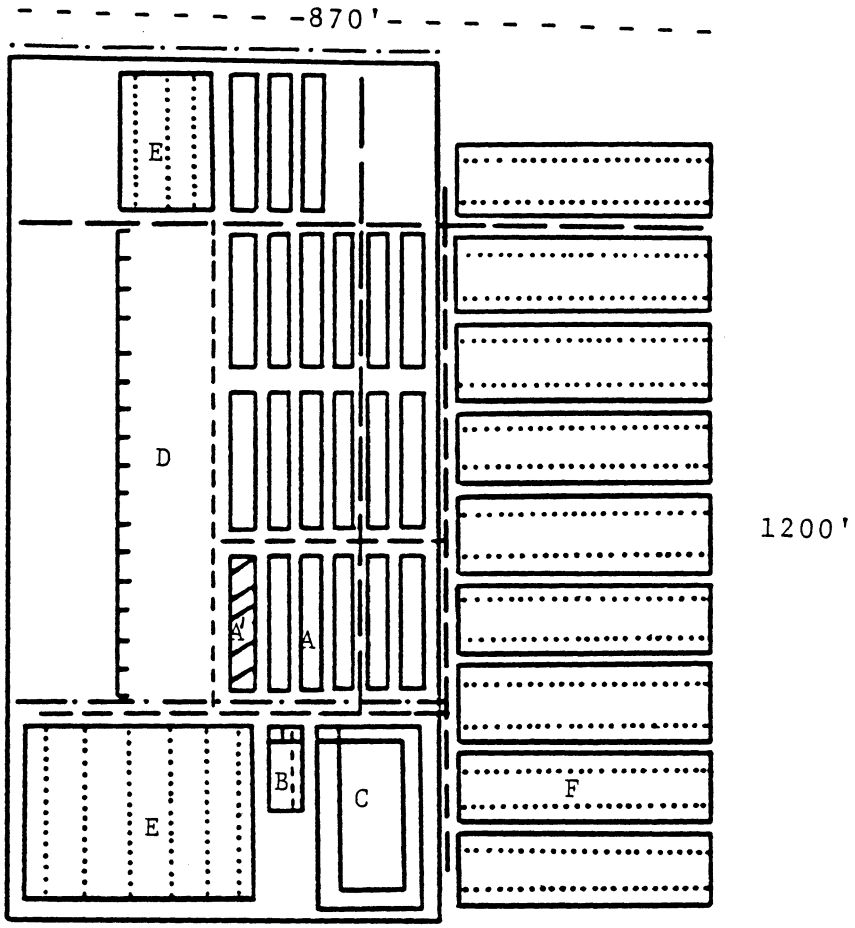
FIG. 1 - Schematic Drawing of a 200 Acre Field Nursery, U.S.D.A. Plant Hardiness Zone Six.




A. Growing plots (131) 100.0' x 435.6' (one acre)
B. Growing plots ( 32) 108.9' x 400.0' (one acre)
C. Growing plots ( 16) 108.9' x 300.0' (3/4 acre)
D. Production facilities, holding area, and field-bed area, 870' x 1200' (Note: one acre from this area was used as a growing plot.
X Denotes placement of water hydrants for irrigation.

6" PVC pipe – – –  8" PVC pipe —— —— ——

FIG. 2 - Schematic Drawing of a 200 Acre Field Nursery's Production Facilities, Holding Area, and Field-Bed Area, U.S.D.A. Plant Hardiness Zone Six.




A. Polyhouse structure, 20' x 200'
A'. Propagation house, 20' x 200'
B. Supply hed, machinery storage, machine shop 40' x 100'
Office & restrooms 20' x 40'
C. Pond, 80' x 220' x 14' depth
D. Shipping area, 10 semitruck loads
E. Holding area, (240' x 280') and (200' x 64')
F. Liner bed area, 100' x 330' each

Scale: 0' 200'

Drainage Tile, 30" :
Watermain, 8" PVC :
Watermain, 6" PVC :
Watermain, 4" PVC :
Above ground irrigation pipe, 3" aluminum

| | | | | |
|---|---|---|---|---|
| Total acreage | = 870' x 1200' | = | 1,044,000 sq. ft. = | 23.97 acres |
| Total polyhouse acrease | = 20(20' x 200') | = | 80,000 sq. ft. = | 1.84 acres |
| Total propagation area | = 20' x 200' | = | 4,000 sq. ft. = | .09 acres |
| Total holding acreage | = (240' x 280') + (200' x 64' | = | 80,000 sq. ft. = | 1.84 acres |
| Total liner bed acreage | = 9(100' x 330') | = | 297,000 sq. ft. = | 6.82 acres |

TABLE 1. Plant Densities and Losses for Field Production of Nursery Plants, U.S.D.A. Plant Hardiness Zones Five and Six, 1985.

| Group | Description | Size of Salable Plant | Years in Rotation | Spacing Between Rows | Spacing In Rows | Sq. Ft. Per Plant* | Plants Per Acre | Est. Percent Loss** |
|---|---|---|---|---|---|---|---|---|
| I | Slow Growing Evergreens - Taxus | 18-24" | 7 | 44" | 28" | 10.2 | 4,272 | 15 |
| II | Fast Growing Evergreens - Juniperus | 18-24" | 5 | 44" | 28" | 10.2 | 4,272 | 15 |
| III | Deciduous Shrubs - Forsythia & Viburnum | 3-4' | 4 | 48" | 30" | 11.9 | 3,652 | 15 |
| IV | Shade Tree - Acer Rubrum | 2" dia. | 5 | 96" | 42" | 33.6 | 1,298 | 10 |
| V | Ornamental Tree - Malus | 5-6'(1 1/2") | 4 | 96" | 36" | 28.7 | 1,518 | 10 |

*Sq. ft. per plant includes necessary perimeter roads.

**Assume 1/2 of loss between first and second year and remainder in last year of production. Losses in the last year of production would be left in the field.

TABLE 2. Planting and Harvesting Requirements for a 200 Acre* Field Nursery, U.S.D.A. Plant Hardiness Zones Five and Six, 1985.

| Plant Group | Description | Propagation** Units Stuck | Bedding Area*** Rooted Cuttings Planted | Field Planting Acres | Acres Planted Per Year | Units Planted Per Year | Units Harvested Per Year**** |
|---|---|---|---|---|---|---|---|
| I | Slow Growing Evergreens - Taxus | 37,710 | 26,700 | 35 | 5.00 | 21,360 | 18,156 |
| II | Fast Growing Evergreens - Juniperus | 48,594 | 37,380 | 35 | 7.00 | 29,904 | 25,418 |
| III | Deciduous Shrubs - Forsythia & Viburnum | 51,927 | 39,944 | 35 | 8.75 | 31,955 | 27,162 |
| IV | Shade Tree - Acer Rubrum***** | - | - | 35 | 7.00 | 9,086 | 8,177 |
| V | Ornamental Tree - Malus***** | - | - | 35 | 8.75 | 13,283 | 11,954 |
| | Total | 138,231 | 104,024 | 175 | 36.50 | 105,588 | 90,867 |

*200 total acres with 175 acres in field growing space, and 25 acres in production facilities, holding area, field bed area, roads, etc.

**For each plant available for transplanting as a rooted cutting into the bedding area, it is estimated that 1.3 cuttings would need to be stuck in the propagation facility.

***For each plant available for transplanting into the field, it is estimated that 1.25 rooted cuttings would need to be planted in the bedding area.

****Assume 1/2 dug in Fall for Fall sales and overwintering and 1/2 dug in the Spring.

*****Shade and Ornamental Trees would be purchased as bare root liners for planting directly into the field.